Technology Innovation Project

Project Brief

TIP 260: A Modular and Dispatchable Battery Energy Storage System

Context

A confluence of industry drivers – including increased deployment of renewable generation, the high capital cost of managing peak demands on the power grid, and large capital investments in grid infrastructure for reliability – is creating new interest in energy storage systems within the electric power industry. However, despite these interests and well-known benefits from using energy storage, to date very few grid-integrated storage installations are in operation in the United States.

BPA may face significant balancing reserve demands within the next few years due to its obligations to integrate increasing amounts of wind energy. Stakeholder concerns have also been raised over relying exclusively on the hydropower system to provide balancing services. BPA and other Northwest electric utilities could quickly permit and deploy modular, transportable, battery storage systems, which BPA could control to support an oversupply of energy and a decrease in loads. This allows BPA to better use excess wind energy produced during low-demand hours and it would also likely provide BPA and other electric utilities with opportunities to avoid or to defer contested and/or costly infrastructure investments.

Goal and Objectives

The goal is to test and evaluate a dispatchable energy storage system that could be deployed by BPA and Northwest electric utilities to help meet the energy challenges facing the Northwest. The research intends to advance energy storage by deploying a modular, dispatchable battery energy storage system with a more efficient and economical power converter system than those currently available. This system will be subjected to real-world trials with a focus on demand response applications (mechanisms that change electricity usage patterns and level out spikes of energy consumption) and constraints caused by the increased integration of renewable energy sources, management of the Federal Columbia River Power System, and potential transmission expansions.

The project is deploying, testing and evaluating one 120 kilowatt/500 kilowatt-hour lithium-iron phosphate battery and using computer models to test how multiple storage units would perform together under real-world conditions. This system, developed by Powin Energy based in Tualatin, Ore., represents a scalable battery storage system that can be readily built and deployed. Research participants will gain hands-on experience with the system and collect operating data.

The Department of Energy's Pacific Northwest National Laboratory has developed a method to automatically control the battery's charge and discharge cycle so that it responds to real-time needs of the power system. PNNL is also developing a computer model to simulate a larger energy storage system made up of many battery units that PNNL will use to evaluate a larger system's performance, reliability and durability in relation to the overall power system's needs.

Why It Matters

Over the next several years, there is a high likelihood that additional energy storage systems will need to be deployed in the region and used for demand response purposes to help integrate renewable energy and to better use excess wind energy produced during low-demand hours. These systems may also be deployed and used by BPA and Northwest electric utilities in ways that help them avoid or defer contested and/or costly infrastructure investments. These systems also provide further dispatchable controls over new energy storage resources. If energy storage systems are to be deployed and used to help address the challenges facing BPA and electric utilities in the region, the question becomes how best to deploy and control these systems so that they provide a maximum benefit at a minimum cost.

Schedule

- Phase I: BPA completed qualification and performance testing of the system at its Medium Voltage Lab in Vancouver, Wash., in March 2013.
- Phase II: Energy Northwest began testing utility-scale wind integration of the system at its 96 megawatt Nine Canyon Wind Project near Kennewick, Wash., in May 2013.
- Phase III: The City of Richland will test the system's ability to help a municipal utility by connecting it to the city's 115/12.5 kilovolt First Street Substation in north Richland, Wash. in early 2014.
- Phase IV: PNNL will test the system's ability to integrate solar power and provide additional demand response testing with the 126-kilowatt photovoltaic power generating station at PNNL's Richland, Wash., campus during the summer of 2014.

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Project Start Date: October 1, 2012
Project End Date: September 30, 2014

Funding:

Total Project Cost:	$624,400
BPA Share:	$240,000
External Share:	$384,400
BPA FY2013 Budget:	$120,000

Links:

www.bpa.gov
www.ci.richland.wa.us
www.energy-northwest.com
www.pnnl.gov
www.powinenergy.com

Participating Organizations:

Bonneville Power Administration
City of Richland
Energy Northwest
GDH
Ideal Power Converters
Pacific Northwest National Laboratory
Powin Energy
PowerWise New Energy Company
Shandong RealForce Enterprises Company

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